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THE WORST GALE OF THE 19TH CENTURY IN THE ENGLISH MIDLANDS.

(*Continued from p.* 57.)

LEICESTERSHIRE—(*continued*).

Great Dalby.—The school, chapel, and many private houses damaged.

Rotherby.—On the main road hence to Leicester there are, within one half-mile, 14 trees blown across the road, 12 so large as not merely to cross the road but to reach into the fields beyond.

Ashby-de-la-Zouch.—Pinnacle blown off the parish church, and hundreds of trees uprooted.

Frisby-on-the-Wreak.—Tremendous storm between 2 and 3 p.m. A strong wall blown down, and also so many trees that the roads were blocked.

Asfordby, Melton Mowbray.—Few houses escaped entirely, and many ricks were blown over.

Melton Mowbray.—Much damage to property, the brewery chimney blown down, and trees of all descriptions broken or uprooted. The streets strewn with tiles, skylights, &c.

Wymondham.—Terrific gale. 1 to 3 p.m.; one lofty and many private chimneys blown over, in fact few buildings escaped entirely.

Sheepshed.—Terrific storm from 1.50 to 2.20 p.m., about 15 yards of the wall of the cemetery was blown down, and the streets were littered with tiles, slates, and spouts.

Loughborough.—Besides small injuries, three factory chimneys fell about 2.30 p.m., one being 114 feet high. A wooden theatre was wrecked, and two gable ends were blown out.

Belton.—Roof of parish church and of many private houses damaged, air full of thatch.

Garthorpe.—A pinnacle blown off the church roof.

Ab-kettleby.—Damage general, but not very serious.

Buckminster.—The conservatory at Lord Dysart's house was completely lifted from its foundations and fell a perfect wreck. Much other damage was done.

Sproxton.—Two heavy double chimney stacks on Sproxton Lodge overturned and broke through the roof.

Waltham.—Gale worst, 2 to 3 p.m.; two houses stripped of every tile and one of all its thatch, the gable end of one house was blown in, several chimneys overthrown.

LEICESTERSHIRE—(*continued*).

Stathern.—Much damage; two cottages had part of their gables displaced and became uninhabitable.

Harby, Melton Mowbray.—Many stacks overturned, and many houses lost tiles, slates or thatch.

RUTLANDSHIRE.

Seaton.—Church spire damaged, and a cross at the end of the nave overthrown.

Barrowden.—Chimneys, roofs and stacks damaged, and the spray from the river carried into the village.

Uppingham.—Much damage from 2 to 2.30 p.m.; the town strewn with slates, chimney pots, &c. So many trees across the main road that the mail cart had to be sent another way.

S. Luffenham.—Windmill wrecked.

N. Luffenham.—A chimney stack overturned at the inn, and slates or thatch torn off nearly every house.

Preston.—There is scarcely a building undamaged, the top of the church spire loosened.

Ridlington.—Terrible gale, many stacks blown away.

Ketton.—Many chimneys blown over, and the roads blocked with fallen trees. Gale worst, 2 to 3 p.m.

Hambleton.—Two large trees overturned about 2 p.m., one of them broke through the roof of a house, and also knocked down the chimneys.

Great Casterton.—Churchyard wall blown down, also chimney at Wesleyan school.

Empingham.—The worst storm remembered. Thatch, tiles and slates were hurled in all directions, and many trees overturned.

Oakham.—Considerable damage, houses unroofed and chimney stacks blown down. Two pinnacles blown off the parish church.

Ryhall.—Violent gale between 1 and 3.30 p.m., carrying away not only stacks and trees but even wooden buildings.

Burley-on-the-Hill.—Great damage to the trees; out of the elm avenue, 60 were torn up.

Teigh.—Several houses stripped and stacks blown away. A pinnacle blown off the church, but it did not break through the roof.

LINCOLNSHIRE.

Stamford.—The majority of the churches and houses were damaged. The gale was so heavy that the water of the Welland was blown into waves, and the spray carried over the bridge. A chimney, 65 feet high, was seen to oscillate, and a gust at 2.15 p.m. brought it down.

Market Deeping.—Houses unroofed and chimneys blown down in great numbers. On the Lolham Road, 27 large trees uprooted.

Crowland.—The storm lasted from 1 to 4 p.m., and did more damage than any storm remembered. The windmills lost their sails, nearly every large chimney is gone, many houses are unroofed, and 17 fine elms were blown down in one row. The streets presented a lamentable appearance, just as if there had been a bombardment.

Castle Bytham.—Windmill damaged, and many roofs stripped.

Bourne.—Great havoc among the trees, and between 2.30 and 4 p.m. the streets strewn with wreckage from the roofs.

LINCOLNSHIRE--(*continued*).

Long Sutton.—Enormous damage; houses unroofed, chimneys blown down, trees uprooted, stacks overturned, and skylights removed. Very few houses escaped.

Holbeach.—A Maltese cross blown off the cemetery chapel, a chimney stack fell through a roof, a long wall was blown down, and several windmills were damaged.

Spalding.—The damage has not been equalled for many years. At the Johnson Hospital, a chimney stack fell through the roof into one of the wards. In several parts of the town, house ends were blown in and roofs removed in whole or in part. At St. John's Church, during afternoon service, part of one end was blown in, and part of the roof removed. The end of *Whaplode* cemetery chapel was also blown in.

Colsterworth.—The gale between 2 and 3 p.m. stripped slates, tiles, or thatch from nearly every roof.

Corby.—Church so damaged that evening service was not held.

Surfleet.—Scarcely a building escaped without loss of tiles or slates, and many chimney stacks were overturned.

Aslackby.—Several trees down and roofs damaged.

Pointon.—The bell turret and bell at the schools blown down, and the north side of the roof of the church so damaged that service could not be held.

Gosberton.—Church and chapel both damaged.

Billingborough.—Terrible havoc for about half-an-hour, about 3 p m.; both public and private buildings have suffered severely. The public hall and the board schools are badly damaged.

Ropsley.—A pinnacle of the church blown down, and in falling it carried away part of the old church, dating back to 1486; private houses merely lost tiles or slates.

Horbling.—Two of the pinnacles of the church, each surmounted by a vane, were carried away.

Donington.—House property suffered severely, and many trees were blown down.

Grantham.—Chimney stack overturned about 3 p.m., and fire escape blown on to roof of engine house; street lamps blown down, and many roofs stripped.

Swaton.—One of the pinnacles was blown off the church, fell on to the chancel roof, and broke through and smashed one of the choir stalls.

Great Hale.—The church was so weakened by the gale that extensive repairs will be necessary.

Boston.—Several warehouses partly unroofed, a corrugated iron building overturned, also a new wall, 60 feet long, and many chimney stacks. Most of the churches and schools were damaged.

Honington.—Streets and roads blocked by broken trees and portions of roofs.

Long Bennington.—Considerable damage to chimneys, and many trees down.

Sleaford.—About 6 feet blown off the top of the Handley Monument, several houses damaged by chimney stacks falling through the roofs, and a pinnacle blown off the west front of the church.

Skegness.—Considerable damage to chimneys and roofs.

Spilsby.—Trees and chimneys have been blown down and stacks scattered, but the damage was less severe than at some other places.

LINCOLNSHIRE—(*continued*).

Horncastle.—The damage was not very serious, but roofs, chimneys, &c., suffered.

Fiskerton.—A gale of unexampled fury, the river Witham was as rough as the sea, and washed over the ferry boats and filled and swamped an open one. Much damage to farm buildings, and many stacks scattered.

Lincoln.—No serious damage.

Alford.—Three of the crocketted pinnacles of the church tower were blown down, two of them cut large holes in the roof of the nave. Many trees and chimneys blown down, and part of the roof taken off the goods station of the G. N. R.

Louth.—Between 3 and 3.30 p.m. it was not safe to be in the streets, not merely owing to falling tiles and masonry, but because it was hardly possible to stand.

Brigg.—In the afternoon, children were lifted off their feet and blown down. Many stacks of chimneys fell, and tiles and chimney pots went away by dozens.

Grimsby.—Considerable damage, several chimney stacks overturned, one fell through the roof of the hospital and killed a patient. The roof of a house at *Scartho* was lifted bodily and carried some distance.

NOTTINGHAMSHIRE.

Cropwell Bishop.—Several buildings damaged, trees and stacks blown over.

Nottingham.—Roof of goods shed at Midland Railway destroyed, and two plate glass shop windows blown in. Many trees down in the suburbs.

CHESHIRE.

Dodcott.—An extensive run of farm buildings wrecked, and cattle buried under them.

Chester.—Windows blown in, chimney pots, chimneys, and tiles blown away.

The following note, which has been received since the issue of our last number, is a valuable addition to the Worcestershire details.

SIR,—In the catalogue of disasters caused by the great storm on March 24th, 1895 in Worcestershire, the damage to the beautiful Priory Church at Malvern might be included. Two pinnacles were blown down and fell through the roof, the cross at the E. end was taken off, and a window was blown in. Many houses were damaged, and on this one, every chimney pot but one was dislodged. The gust which did the mischief occurred about 1 p.m.—Yours faithfully,

C. S. PRINGLE.

Knotsford Lodge, Malvern.

SUMMARY.

From the evidence in the previous 11 pages of this article it will be seen that the storm crossed from S. Wales to Lincolnshire between 11 a.m. and 4 p.m. on Sunday, March 24th, 1895. There is no day or time at which so few regular meteorological observations are made as during these five hours on a Sunday. Consequently in studying the storm path we have to rely upon (1) the reports of skilled observers such as those in the *Met. Mag.* 1895 pp. 41-43 and 51-52, (2) the records of self-recording instruments, and (3) the

numerous statements made by our correspondents and in the local newspapers.

The Meteorological Office had ordered storm signals to be hoisted, and at 8 a.m. on the 24th, the centre (28·50 in.) of a well-marked cyclone was over the Shetland Isles, but it was not that cyclone which caused the mischief, but a "secondary" at the South of Ireland where (but for its existence) the pressure would have been about 29·2 in. Instead of 29·2 in., however, it was under 29 inches, and it was this small disturbance which rushed across Wales and England, leaving death and disaster along its track, and which at 6 p.m. had (according to the *Weekly Weather Report*) nearly reached Denmark. This would imply an average velocity of translation of about sixty miles an hour.

Next we turn to the times recorded by our own correspondents, and in the notes which we have already given—some, it is true, are vague—a very few (*e.g.*, Peterborough, 1.50 p.m.) are obviously wrong, but we tabulated them all before putting any of them on a map, and therefore without adapting them to fit any theory. Having plotted them all (about 70 places) on a map we find that they agree very well with a path going E. 30° N. from St. Bride's Bay in South Wales to Spurn Head, being over Haverfordwest at 11 a.m. and going at the rate of *58 miles an hour*—thus agreeing very closely with the direction and velocity obtained from the publications of the Meteorological Office.

Very little damage was done north of the path which we have mentioned, nor was the mischief serious on or near to the path on its south side—but it seems that the greatest havoc was wrought in a zone whose northern limit was about 30 miles south of the line, and which increased in breadth (going eastwards) from 50 to about 70 miles.

These features we have represented on the accompanying map, which we are quite aware is much more rectilinear than is usual. The path might have been drawn as a curve from a centre 500 miles to N.N.W., and the hour lines might have been curves drawn with radii of 100 miles, but straight lines fitted the facts better than curves; and, after all, the position of the × (sites of damage) and the times recorded in our account are the essential features, and having put the facts on record, we do not at all mind how severely our diagram is attacked.

Since drawing the map, we have come upon two observatory reports giving time, and it is satisfactory to find that they fit almost precisely the lines laid down. The statements are:

Birmingham.—The greatest pressure of the wind was 37lbs., but the time is not known, as *the oscillation of the building stopped the clock at* 1.30 *p.m.* (According to our map, the centre passed Birmingham at 1.25 p.m.).

Greenwich.—Max pressure 36lbs. at about 2.10 p.m. (Precisely the time shown by our map).

As to the damage, we are aware that our list is far from complete, and it would be absurd to attempt to put any specific sum as covering the disasters. The loss of life was wonderfully small, only 14 deaths are reported, but the cases of injury were far more numerous.

The foregoing reports from more than 200 localities naturally afford material for consideration. We are, of course, aware that an open door or window facing a very strong wind may cause one on the opposite side of the house to be blown out, and there are several instances in the preceding list of windows and of gables being blown *in*, but on the other hand we find more than a dozen cases, many of which could be very well explained by the expansion of the air inside the building, owing to the passage of a diminished atmospheric pressure. The following are the cases to which we refer.

Place.	Event.	Page on which reported.
Tottenham Court Road ...	Window blown out	50
Peterborough	Gable ends forced out. Wood and iron stable lifted bodily.....	51
Godmanchester.....	Gable fell outwards	51
Soham	Several cottages had one end blown out.....	52
Norwich	Workhouse roof lifted. Roofs of two cottages lifted.....	53
North Heigham	The gables of several houses fell out	53
Ironbridge	Two windows blown out.....	54
Worcester.....	The roof of a tannery was lifted bodily	55
Stratford on-Avon	Roof of goods shed lifted off	55
Broughton Astley	A newly-built shed, 120 ft. long and roofed with slate, was lifted bodily and carried some feet	56
Loughborough	Two gable ends were blown out	65
Buckminster.....	The conservatory .. ... was completely lifted from its foundations and fell a perfect wreck	65
Grimsby	The roof of a house at Scartho was lifted bodily and carried some distance	68

ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this Society was held on Wednesday evening, May 20th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. E. Mawley, F.R.H.S., President, in the chair.

Mr. R. H. Curtis, F.R.Met.Soc., read a paper on the exposure of anemometers, and showed photographs of the positions of several of the British anemometers, and referred to the deflection of the wind by the various buildings on which they were mounted, and by surrounding objects. The effect of surroundings in both diminishing and increasing the records obtained was clearly exhibited by a critical

discussion of the results of the Kew pattern Robinson, the Stokes's bridled, and the Dines's pressure tube, anemometers at Holyhead. The position of the instruments was shown in plan, and by near and distant views from various points of the compass. The exposure of the Tube and Bridled instruments is proved to be satisfactory by the accordance of the results, while the Robinson, mounted 5 feet above the apex of the lantern of a disused lighthouse, and 53 feet above the floor of the pier, is variously affected by sheds and erections on the pier, although all of them are about 30 feet below the cups.

The values were arranged according to the direction of the wind under eight points, and afterwards the observations under each direction were grouped according to the velocity, in 10-mile groups; *e.g.*, all the observations of wind from North in which the force ranged from 26 to 35 miles per hour, as shown by the Robinson instrument, were put together, and the mean difference between the records of the two instruments obtained; and similarly for each of the other seven points, and for the other velocities. No observation in which the force was less than 11 miles per hour was used, and the lowest group included all velocities from 11 to 25 miles per hour.

Taking first the means of all the observations under each point, irrespective of velocity, it was found that with wind from N., S.E., and S., the record of the Robinson instrument is *greater* than that of the "Tube" instrument; whilst with winds from E., S.W., W., and N.W., it is *less*; with a N.E. wind, however, the record by both instruments is the same. The greatest excess is 13·2 per cent. with S. winds, and the greatest deficiency 22·8 per cent. with W. winds.

Examining the groupings under velocities, it is found that generally the amount of the difference varies directly with the force of the wind, and therefore the maximum errors are greater. Thus the greatest excess is 18·3 per cent. with S. winds of velocity 36 to 45 miles, and the greatest deficiency 24·1 per cent. with W. winds, velocity 11 to 25 miles.

In grouping all winds under eight points of the compass, the results for any one wind are to a certain extent masked by the inclusion of winds blowing in a slightly different direction (*e.g.*, the observations under E. include all between E.N.E. and E.S.E.). This is clearly shown by the tabulation of about 40 observations of velocity 11 to 25 miles at each of the sixteen points, which gives for S.S.E. an excess of 21·8 per cent., and for W. a deficiency of 25·2 per cent., or a total range of error of 47 per cent.

The conclusion of the whole matter is: that for anemometrical records to be reliable, not only must the instrument be exposed in an open place, free from local obstructions, but the stand which carries it must offer practically no resistance to the wind; that the "stand" should be formed by a house, no matter what its shape or size, unless the cups can be placed farther above the roof than is

generally possible, is undesirable, not to use a stronger term. A suitable open structure, with a hut for the recording apparatus, could generally be erected wherever a Robinson, or a pressure plate, instrument is required; but one of the great advantages offered by the Dines's "Tube" instrument is the facility with which the vane can be placed in a satisfactory position.

In the discussion which followed, the President spoke of the unsatisfactory condition of Anemometry shown by the paper, and said that he would like to see a comparison of the records of a set of similar instruments well exposed at different heights above ground.

Mr. Gaster said it was evident that the Robinson anemometer at Holyhead was sheltered, and that many others were worse. Comparison of the light vessel and anemometer observations at Yarmouth showed that with a W. wind of 50 miles an hour, the instrument recorded only 25 miles owing to the friction in passing over the houses in the town.

Mr. Symons exhibited a diagram drawn by the Rev. F. W. Stow, illustrating the effect on air currents of objects surrounding a rain gauge, and said that as early as 1862 or 1863, the late Dr. Clouston, of Orkney, had pointed out the bad result of placing an anemometer on the roof of a house.

Mr. Dines considered the bridled anemometer to be the only reliable form of pressure instrument in use. If the exposure be bad for one direction or force it is bad for all. He had three similar instruments, 40 feet, 20 feet, and 10 feet above the roof of his house, and found that from directions in which the exposure was good, taking the 40-feet instrument as true, the 20-feet gave a record of 90 per cent., and the 10-feet of 80 per cent., while from a sheltered direction the 20-feet gave 80 per cent., and the 10-feet 70 per cent., the difference being the same with all velocities.

Mr. C. Harding did not think he was speaking too strongly in describing the whole science of Anemometry as rotten. At Yarmouth the town reduced the velocity of a W. wind by half, while an E. wind was increased by striking the house on which the instrument was fixed, and being deflected upwards. He believed that the enormous difference in the records at Fleetwood and Liverpool was entirely due to exposure, while the paper showed that at Holyhead, which had been looked upon as one of the best stations in the country, there was an error of nearly 50 per cent. between the records of two different winds. He referred to the good work done by Mr. Chatterton for the Wind Force Committee in comparing the records of anemometers with the records of light ships, and thought that the comparison of the Beaufort Scale and Anemometer results should be re-worked.

Mr. Baker hoped that the paper would bear good fruit, as the question of Anemometry was to be discussed at the International Congress at Paris.

Mr. Munro said that the Robinson anemometer was so constructed

as to be unsuitable for fixing more than about 15 feet above a roof, as the upper works weigh about three cwt.

Mr. Baldwin Latham compared the measurement of wind velocity to the measurement of the current in a river in which, with a rocky bed it is almost impossible to get true results.

Admiral Maclear, Dr. Mill, and Messrs. R. H. Scott, R. Inwards, H. Southall, and C. E. Peek also took part in the discussion.

An interesting collection of photographs of clouds, presented to the Society by Mr. H. C. Russell, F.R.S., of the Sydney Observatory, was also exhibited.

FOG, MIST, HAZE.

To the Editor of the Meteorological Magazine.

SIR,—It appears to me that your correspondent in this month's Magazine has stated very fairly the facts which should form the basis of any discussion as to the use which meteorologists should make of the above terms; and especially do I agree with him in the distinction which he draws between the artificially produced smoke-fogs of large towns, and "nature's fog," which, as he points out, is always composed of water particles alone.

To discriminate between these two phenomena, which resemble each other only in the fact that they both cause obscuration, is, I consider, most important, since the conditions under which they are formed are essentially different in the two cases. To do so, however, in such a city as London, is not always easy; because, although the anti-cyclonic smoke-fogs are generally free from water particles, and are true "dry fogs," the water fogs are always combined with more or less smoke, making it sometimes difficult to say which predominates, and in which category the fog should be placed. If, however, the smoke-fog is to be confined to anti-cyclonic conditions, as I gather is the view of your correspondent, this difficulty would be much reduced.

As regards the suggested definitions, I do not think it wise that the difference between fog and mist should rest upon what can "be seen with the naked eye"—a test in which I fear two persons would be very apt to disagree. If I correctly understand your correspondent, he would describe as "mist" a fog in which the water particles were just merging into tangible rain-drops—a view of the matter which I think will meet with the approval of most meteorologists, although I know that many have hitherto regarded a mist as a slight fog. But, assuming your correspondent's definition to be acceptable, it would surely be possible to define the condition in such terms as would make what is meant perfectly clear, without leaving much to the judgment of observers, and leaving still less to the arbitration of a sense which varies so much with different men as eyesight.

There is only one other criticism I would offer, which is that town smoke, "*drifting over the country*," would in all probability have become so attenuated, as soon as it had got clear of its place of origin, as to bring it within the definition given for "haze," rather than fog.

But, generally, I agree with the definitions offered; and at all events a practical scheme, based on a correct view of the phenomena, has been put forward, which it should not be difficult to modify in such a way as to make it generally acceptable to meteorologists.

I am, yours obediently,

F.R.MET.SOC.No. 2.

BURST WATER PIPES.

OUR readers may remember the discussion in the *Met. Mag.* in 1895 as to burst water pipes, and that we urged that the water in the mains did not freeze because the ground around the pipes was frozen—*i.e.*, because they were not laid deep enough—but because ice-cold water was poured into them, and because cold was conducted to them by inadequately protected house services and by fire hydrants—in fact, by cold conducted to the mains otherwise than through the earth.

Dr. Jordan's report* confirms this view. He says (p. 15): "The freezing of water pipes caused considerable inconvenience in this district [Lancashire]; the nature of the ground and the amount of shade must have had some influence in this respect, because some pipes, fully 2 feet deep, appear to have frozen. My notes show that at 2 feet deep, in ground fully exposed, the lowest temperature recorded was 32°·8 on February 17th, 18th, and 19th, 1895."

We have, therefore, here one more case of the water pipes being colder than the soil at the depth at which they were sunk.

We hope that it will be many years before such a frost occurs again in this country, but we feel sure that the remedy lies rather in stopping the conduction of cold to the mains, than in the costly method of sinking them to a considerable depth.

LIGHTNING AND TREES.

INVESTIGATIONS made by Dr. Carl Müller, and reported in *Himmel und Erde*, show that lightning prefers to strike certain kinds of trees. Under the direction of the Lippe-Detmold Department of Forestry, statistics were gathered showing that in eleven years lightning struck fifty-six oaks, three or four pines, twenty firs, but not a single beech tree, although seven-tenths of the trees were beech. It would seem, then, that one is safer in a storm under a beech tree than under any other kind.

* Report of F. W. Jordan, M.R.C.S., Dip.San.Sci., &c., Medical Officer of Health to the Heaton Norris District Council for the year 1895. 8vo., Heaton Norris, 20 pages and folding plate.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1895.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	56·4	5	26·1	22	44·9	35·2	36·5	87	62·9	25·9	2·19	16	7·0
Malta	69·9	19	44·2	31	61·2	53·4	48·7	76	115·8	38·0	3·52	15	6·9
Mauritius	83·7	8	67·3	16	81·6	72·2	67·3	75	134·5	57·2	6·55	16	6·5
Calcutta	80·6	2	47·4	25	76·7	54·7	50·9	61	136·6	38·0	·00	0	2·2
Bombay	87·9	30	66·0	15	85·1	70·1	63·3	63	135·5	51·8	·00	0	1·5
Ceylon, Colombo	89·7	16	69·2	12	85·9	73·2	69·2	76	150·0	62·0	9·44	14	5·6
Melbourne	98 9	8	45·3	30	77·7	54·8	51·9	64	155·9	35·1	2·17	15	5·1
Adelaide	99·8	7	50·2	22	82·3	59·2	49·9	48	155·5	39·8	·69	9	3·9
Sydney	96·1	15	58·5	30	80·5	65·3	59·0	64	157·2	49·4	2·90	20	5·8
Wellington	76·0	30	53·0	12	68·9	57·5	55·1	75	145·0	40·0	1·62	12	4·6
Auckland	83·0	31	52·0	1	72·6	58·1	55·2	71	142·0	48·0	·99	5	4·0
Jamaica, Kingston	89·0	8	62·8	21	85·6	68·2	65·5	74	...	...	1·87	3	3·2
Trinidad	90·0	5	67·0	*var.*	86·5	69·4	71·1	81	165·0	64·0	7·32	8	...
Grenada	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	53·9	20	1·4	12	36·0	23·2	28·0	84	70·0	—3·0	4·21	15	8·0
New Brunswick, Fredericton	57·7	31	—14·8	13	32·6	14·4	21·4	78	...	...	2·66	8	5·1
Manitoba, Winnipeg	43·9	13	—28·7	26	19·9	—3·9	...	...	...	...	1·75	13	5·6
British Columbia, Esquimalt	55·1	11	24·2	17	44·1	36·1	38·6	92	...	...	11·60	26	8·1

REMARKS.

MALTA.—Adopted mean temp. 56°·9, 0°·7 above the average. Mean hourly velocity of wind 12·2 miles. Average temp. of sea 64°·9. Thunderstorms on 4 days, and lightning on 2 other days. H on 3 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·7 below, of dew point 0°·6 below, and rainfall 1·37 in. above, their respective averages. Mean hourly velocity of wind 11·8 miles, or 0·9 above average; extremes, 27·9 on 26th, and 0·0 on 13th; prevailing direction, E.S.E. to E. by N. Lightning on 18th, 19th, and 20th. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Lightning was seen on the 2nd. Thunderstorms occurred on the 3rd, 4th, 17th, and 18th. D. G. MANTELL.

Adelaide.—Mean temp. 0°·2 below the average of 38 years; rainfall ·16 in. below the average. Total rain for the year 21·28 in., or ·83 in. above the average. C. TODD, F.R.S.

Sydney.—Mean temp. 3°·1 above, humidity 5·3 below, and rainfall ·30 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part of the month; showery from 4th to 11th, and slight rain occasionally from 15th to 23rd, with intervals of fine weather; the latter part fine. Prevailing wind N.W.; strong on nine days. Mean temp. 2°·4 above the average, and rainfall 2·19 in. below, or less than half, the average. R. B. GORE.

Auckland.—An unusually dry month, the rainfall being less than half the average. Mean temp. slightly below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 3·9 miles. "Northers" on 11th, 13th, and 14th. Kingston rainfall about the average; Northern half of Island two-thirds, and Southern half one-fourth, the average fall, giving a mean of half the average for the Island for the month. Kingston rainfall for the year 55 per cent., and Island rainfall 95 per cent., of the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·61 in. above the average of 30 years. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	·38	XI.	Lake Vyrnwy	...
,,	Birchington, Thor	·31	,,	Corwen, Rhug	·16
,,	Hailsham	·36	,,	Carnarvon, Cocksidia ...	...
,,	Ryde, Thornbrough	·50	,,	I. of Man, Douglas	·27
,,	Emsworth, Redlands ...	..	XII.	Stoneykirk, Ardwell Ho.	·61
,,	Alton, Ashdell	·33	,,	New Galloway, Glenlee	·62
III.	Oxford, Magdalen Col..	·19	,,	Lilliesleaf, Riddell	·78
,,	Banbury, Bloxham	·21	XIII.	N. Esk Res. [Penicuick]	·50
,,	Northampton, Sedgebrook	·27	,,	Edinburgh, Blacket Pl..	·57
,,	Alconbury	·39	XIV.	Glasgow, Queen's Park..	·60
,,	Wisbech, Bank House...	·45	XV.	Inverary, Newtown	·86
IV.	Southend	·19	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	·78	,,	Islay, Gruinart Schools..	·38
,,	Colchester, Lexden	·21	XVI.	Dollar.....	·70
,,	Rendlesham Hall	·30	,,	Balquhidder, Stronvar...	·85
,,	Diss	...	,,	Ballinluig	·62
,,	Swaffham	·70	,,	Dalnaspidal H.R.S.....	1·27
V.	Salisbury, Alderbury ...	·30	XVII.	Keith H.R.S.....	1·67
,,	Bishop's Cannings	·27	,,	Forres H.R.S.	...
,,	Blandford, Whatcombe .	·28	XVIII.	Fearn, Lower Pitkerrie..	·90
,,	Ashburton, Holne Vic...	·02	,,	N. Uist, Loch Maddy ..	1·50
,,	Okehampton, Oaklands.	·07	,,	Invergarry	·77
,,	Hartland Abbey	·07	,,	Aviemore H.R.S.	·99
,,	Lynmouth, Glenthorne.	·08	,,	Loch Ness, Drumnadrochit	·85
,,	Probus, Lamellyn	·05	XIX.	Invershin	·39
,,	Wellington, The Avenue	·07	,,	Scourie	3·46
,,	Wincanton, Stowell Rec.	·17	,,	Watten H.R.S.....	1·63
VI.	Clifton, Pembroke Road	·30	XX.	Dunmanway, Coolkelure	·10
,,	Ross, The Graig	·18	,,	Cork, Wellesley Terrace	...
,,	Wem, Clive Vicarage ...	·32	,,	Killarney, Woodlawn ...	·29
,,	Cheadle, The Heath Ho.	·24	,,	Caher, Duneske	·15
,,	Worcester, Diglis Lock	...	,,	Ballingarry, Hazelfort...	·16
,,	Coventry, Coundon	·34	,,	Limerick, Kilcornan ...	·20
VII.	Ketton Hall [Stamford]	...	,,	Ennis	...
,,	Grantham, Stainby	·60	,,	Miltown Malbay	·55
,,	Horncastle, Bucknall ...	·77	XXI.	Gorey, Courtown House	·15
,,	Worksop, Hodsck Priory	·56	,,	Athlone, Twyford	·28
VIII.	Neston, Hinderton	·45	,,	Mullingar, Belvedere ...	·27
,,	Southport, Hesketh Park	·47	,,	Longford, Currygrane...	·36
,,	Broughton-in-Furness ...	·63	XXII.	Woodlawn	·58
IX.	Ripon, Mickley.....	·42	,,	Crossmolina, Enniscoe ..	·93
,,	Melmerby, Baldersby ...	·46	,,	Colloony, Markree Obs.	·96
,,	Scarborough, Obs.	·85	,,	Ballinamore, Lawderdale	1·15
,,	Middleton, Mickleton ...	·49	XXIII.	Lough Sheelin, Arley...	·37
X.	Haltwhistle, Unthank...	·55	,,	Warrenpoint.....	·17
,,	Bamburgh	·89	,,	Seaforde..	·25
,,	Keswick, The Bank.....	·74	,,	Belfast, Springfield	·84
XI.	Llanfrechfa Grange	...	,,	Bushmills, Dundarave..	1·07
,,	Llandovery	·05	,,	Stewartstown	·67
,,	Castle Malgwyn	·17	,,	Killybegs	...
,,	Builth, Abergwesyn Vic.	·11	,,	Lough Swilly, Carrablagh	1·27
,,	Rhayader, Nantgwillt ...	·11			

MAY, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·14	— 1·76	·12	21	3	78·9	29	36·1	4	0	5
II.		Maidstone (Hunton Court)...	·32	— 1·06	·18	21	3	...	...	...	...	..	...
„		Strathfieldsaye	·26	...	·16	21	3	...	...	...	...	...	...
III.		Hitchin	·32	— 1·63	·22	21	3	77·0	12	31·0	1	2	...
„		Winslow (Addington)	·31	— 1·79	·23	21	3	77·0	18*b*	29·0	2	4	6
IV.		Bury St. Edmunds (Westley)	·61	— 1·14	·38	20	5	71·0	18	34·0	1	0	...
„		Norwich (Brundall)	·73	...	·35	20	7	76·0	14	34·2	5	0	9
V.		Weymouth(LangtonHerring)	·15	— 1·46	·11	21	3	72·0	12	37·0	3	0	...
„		Torquay (Cary Green)	·03	...	·03	21	1	72·1	29	40·0	1	0	0
„		Polapit Tamar [Launceston]..	·07	— 1·76	·07	21	1	76·4	12	30·0	4	2	3
VI.		Stroud (Upfield)	·29	— 1·75	·22	21	5	76·0	31	37·0	2, 3	0	...
„		ChurchStretton(Woolstaston)	·29	— 2·58	·08	21	6	74·0	12*c*	34·5	1	0	4
„		Tenbury (Orleton)	·32	— 2·23	·16	20	4	79·1	12	30·5	4	2	7
VII.		Leicester (Barkby)	·64	— 1·33	·54	21	5	79·0	12*c*	23·0	1	7	14
„		Boston	·69	— 1·03	·30	21	9	85·0	12	31·0	1	2	...
„		Hesley Hall [Tickhill].....	·52	— 1·52	·39	21	6	78·0	12	29·0	3	4	...
VIII.		Manchester(PlymouthGrove)	·60	— 1·75	·42	21	5	80·0	12	33·0	1	0	1
IX.		Wetherby (Ribston Hall) ...	·50	— 1·45	·45	23	2	...	...	...	...	...	...
„		Skipton (Arncliffe)	·74	— 2·98	·44	19	6	..	...	...	...	...	...
„		Hull (Pearson Park).	·62	— 1·26	·31	21	7	77·0	12	31·0	2	1	6
X.		Newcastle (Town Moor)	·71	— 1·04	·31	21	5	...	...	...	...	...	...
„		Borrowdale (Seathwaite).....	1·17	— 7·44	·61	19	5	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	·14	— 2·71	·08	13	3	...	...	...	...	...	...
„		Haverfordwest	·06	— 2·30	·06	21	1	75·9	12	30·2	2	2	7
„		Aberystwith (Gogerddan) ...	·78	...	·38	18	3	74·0	11	...	...	...	...
„		Llandudno.....	·53	— 1·40	·25	21	3	72·0	12	37·0	1	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	·68	— 1·84	·38	18	3	79·0	11*d*	31·6	1	1	...
„		Jedburgh (Sunnyside).....	·89	— 1·01	·48	21	5	82·0	11	35·0	4	0	...
XIV.		Colmonell	·70	...	·43	18	3	79·0	11	29·0	1	...	...
XV.		Lochgilphead (Kilmory).....	·95	— 2·40	·50	18	6	...	...	31·0	1	1	...
„		Mull (Quinish).....	1·52	— 1·43	·39	19	13	...	...	...	...	...	...
XVI.		Loch Leven Sluices	·60	— 1·96	·40	19	2	...	...	...	...	...	...
„		Dundee (Eastern Necropolis)	·75	— ·91	·35	21	6	80·6	11	35·5	1	0	...
XVII.		Braemar	·98	— 1·43	·40	19	8	73·3	11	32·3	4	0	13
„		Aberdeen (Cranford)	1·25	...	·57	21	11	70·0	11*d*	37·0	1	0	..
XVIII		Strathconan [Beauly]	1·26	— 1·83	·80	20	3	...	...	..	...	...	...
„		Glencarron Lodge.....	2·07	...	·77	19	13	74·0	10	34·4	1	0	...
„		Cawdor	·57	— 1·18	·22	19	8	...	...	...	...	..	...
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
„		S. Ronaldsay (Roeberry).....	1·73	+ ·01	·64	21	10	68·0	10	39·0	2	0	...
XX.	IRELAND.	Darrynane Abbey.....	·44	...	·19	5	5	...	...	...	...	...	...
„		Waterford (Brook Lodge) ...	...	...	...	...	...	...	...	...	...	...	...
„		O'Briensbridge (Ross)	·26	...	·06	18*a*	5	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	·12	— 2·22	·10	19	2	...	..	...	...	...	...
„		Dublin (FitzWilliam Square)	·19	— 1·74	·08	18	7	71·8	29	36·2	1	0	1
XXII.		Ballinasloe	·24	— 2·45	·08	4	6	75·0	13	28·0	1	1	...
„		Clifden (Kylemore)	1·44	...	·43	18	6	...	...	...	...	.	...
XXIII		Waringstown	·30	— 2·14	·16	18	5	80·0	26	33·0	2	0	3
„		Londonderry (Creggan Res.).	1·09	— 1·43	·32	4	10	...	...	...	...	...	...
„		Omagh (Edenfel)	·85	— 1·62	·32	18	5	76·0	12	31·0	1	1	1

+Shows that the fall was above the average ; —that it was below it.

a—and 23. *b*—and 29. *c*—and 18, 19. *d*—and 12.

METEOROLOGICAL NOTES ON MAY, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

HITCHIN.—This year has yielded the driest five months in the record, which commenced in 1850, R only 5·22 in., of which 3·08 in. fell in March.

ADDINGTON.—The least May rainfall registered in 25 years. From the 1st to the 18th not a drop of R fell, and from April 17th to May 19th only ·06 in. Prevailing winds N.E. One very heavy peal of T on the 20th, and Steeple Claydon Church struck by L. Drought getting very serious at the close of the month.

BURY ST. EDMUNDS, WESTLEY.—A dry month, with harsh winds and almost continuous drought. The rain of the 20th was very partial, many places near having very little. The hay crop is likely to be very short, and if R does not come soon it will be very serious for all crops. T on 13th and 20th.

NORWICH, BRUNDALL.—A very dry month, and rain greatly wanted at the close. An unusual prevalence of N.E. winds, and great range of temp. on some days. On the 12th the temp. fell 23 degrees between 4.30 p.m. and 8.30 p.m., and on the 14th it rose from 34°·4 in the morning to 76° in the afternoon, or a range of 41°·6 in the day; being the greatest diurnal range since observations commenced in 1883. H on 1st and 20th; T at 6 p.m. on 12th; solar halo and faint parhelion at 6.30 p.m. on 6th.

WEYMOUTH, LANGTON HERRING.—The smallest R in any May since 1875, and only 5·00 in. has fallen since the beginning of the year. This is the smallest amount of R for the first five months of the year in 22 years, and is only ·48 per cent. of the average. The mean 9 a.m. temp., 56°·8, is 2°·9 above the average of 24 years, and, with the exception of 1889 and 1893, is the highest in that period. This is the seventh month in succession in which the temp. has been above the average. The drought is beginning to be seriously felt in this neighbourhood, and there has been very little dew. T on the 20th; fog on the 14th; a gale on the 19th; lunar halo on 21st.

TORQUAY, CARY GREEN.—R 2·04 in. below the average. Mean temp. 56°·1, or 3°·0 above the average. Duration of sunshine 296 hours 45 minutes, being 77 hours 5 minutes above the average; no sunless day.

POLAPIT TAMAR [LAUNCESTON].—A most unseasonable month, though fine throughout. The driest month recorded here for over 15 years, and the total for the first five months of the year is 2·24 in. below the average. Fog on the 15th.

WOOLSTASTON.—A warm but exceedingly dry month, with very cold nights. The want of water was severely felt, and the prospects of the hay crop are ruined. R fell very slightly on 6 days only. H and vivid L on the 20th. Mean temp. 54°·7.

TENBURY, ORLETON.—The driest month of May recorded here in 66 years, with the exception of May, 1844, in which month the same quantity of rain fell as this month. The weather was generally bright, with a large percentage of N. and N.E. wind, but the temp. of the month was 2°·5 above the average of 35 years. T on 13th, 18th, and 20th; H on 20th. Temp. above 70° on 9 days.

LEICESTER, BARKBY.—The country looking beautiful, but very dry. Hot days, but chilly nights. Constant N. E. winds. Prospect of fruit destroyed by sharp frost on 1st. First swift seen on 9th. Mean temp. 53°.

WALES.

HAVERFORDWEST.—The rain that was anxiously looked for at the end of April has never come. Excepting 1859 (when no rain fell) this is the driest May in my record, which dates back to 1849. I cannot obtain any record of

May, 1831, but well remember the brightness, absence of R, and heat of that year. Barley in some places has not come up. Except fields that were shut up over the winter, hay crops will be a total failure; currants and fruit generally have withered on the trees, and on shallow lands vegetation is completely burnt up. General character of the days bright, cloudless, and hot, with winds mostly from N.E.; the nights cool, calm, and cloudless, with an unusual number of ground frosts. High bar. throughout the month. Every tree, shrub, and flower so forward that when June comes there will be nothing to come into bloom.

ABERYSTWITH, GOGERDDAN.—Very bright and dry throughout the month, with N.E. winds.

SCOTLAND.

CARGEN.—Exceptionally fine during the month, and unusually warm, very slight rainfall and a large amount of sunshine having been recorded. A notable feature was the high bar. pressure; the mean, 30·203 in., a "record" for May, has only once been exceeded in any month during 37 years (30·332 in. in February, 1891). On only one day (the 27th) was the bar. below 30 inches during the whole 24 hours. The mean bar. pressure of the first five months of this year has reached the unparalleled figure of 30·007 in. The mean temp., 54°·8, is 4° above the average, and the highest recorded in May, the nearest approach to it being 54°·5 in 1889. An unusually warm period prevailed during the 13 days 6th to 18th, when the mean temp. was 57°·5; on the 11th and 12th, the extraordinary high max. of 79° was reached, only exceeded in May, 1864, when on the 18th and 19th 81° and 82° respectively were registered. The range of temp. for the three days 10th to 12th exceeded 34°, and on the 11th was 36°·8; the nights being generally very clear, radiation produced low minima. The somewhat high difference (4°·4) between the readings of the dry and wet is an indication of the very dry state of the atmosphere. The R of the month, ·68 in., has only twice been lower during May, viz., ·60 in. in 1876, and ·06 in. in 1894. Only once, in 1881, when 295 hours were recorded, has this month's amount of sunshine—291 hours—been exceeded. The wind was very light, Easterly and Northerly prevailing for 24 days. Vegetation not so far advanced as the mild winter seemed at one time to promise. Flowering trees and shrubs fully three weeks earlier in bloom than last year.

JEDBURGH, SUNNYSIDE.—The rainfall of the month was remarkably small, E. and N.E. winds prevailing. The day temp. was high, but that of the night low, falling to 36° several times. Vegetation was wonderfully fresh, but the drought began to be felt at the close. The hawthorn was most luxuriant, more so than for a long period. Garden fruits of all kinds very promising.

COLMONELL.—Rainfall 1·84 in. less than the average of 19 years. Mean temp. 54°·1.

LOCHGILPHEAD, KILMORY.—Remarkable for drought, May being often a very wet month. Temp. very variable; a good deal of Northerly wind.

S. RONALDSAY, ROEBERRY.—A fine month, with average rainfall. Mean temp. 50°·5.

IRELAND.

DARRYNANE ABBEY.—The driest month registered here, the next driest being November, 1879, with ·75 in. on 9 days. Very hot also, with light winds and very calm sea.

O'BRIENSBRIDGE, ROSS.—The smallest rainfall here in any month for 50 years, the next to it being May, 1859, with ·34 in. A most beautiful month, with many very warm days, and some slight frosts.

DUBLIN.—A beautiful month, very similar to May, 1895—bright and dry, without any severe night frosts. The amount of cloud is very low, 4·3. The mean temp., 55°·2, is 3°·2 above the average. In the thirty-one years ending with 1895, May was coldest in 1869 (48°·2) and warmest in 1893 (56°·7). Solar

halos were seen on the 13th, 21st, and 24th. Lunar halos on the 9th, and aurora on the 2nd. High winds occurred on 3 days, attaining the force of a gale (from N.N.W.) on the 20th.

OMAGH, EDENFEL.—A very fine month, the cool polar winds of the first week having speedily given way to a week of hot summer weather, when on the 12th the highest shade temp. ever registered here so early in May was recorded. The third week was cool, with considerable rainfall, but no frost, and the remainder of the month was fine, dry, and generally clear. These conditions, following the mild winter, have resulted in foliage and flower of phenomenal luxuriance, both on forest trees and flowering shrubs.

MARSH GAS UNDER ICE.

PROFESSOR IRA REMSEN describes a curious case of the accumulation of marsh gas under ice. A number of skaters were on a large artificial lake covered with ice. In places white spots were noticed in the ice, suggesting air bubbles. A hole was bored in the ice and a match applied. The thin jet of flame burst up, and the gas was found to be marsh gas, formed by the decomposition of organic matter at the bottom of the lake. Professor Remsen suggests that skating ponds illuminated by natural gas are among the possibilities of the future.—*Science.*

THE FLOATING ISLAND IN DERWENTWATER.

The foregoing paragraph is of interest as a contribution towards the facts respecting floating islands. It is curious that Prof. Remsen's lake should give off gas at so low a temperature. We do not expect to see Derwentwater illuminated as the Prof. suggests, because there the generation of gas is slight, except at temperatures at which ice could not exist.

A HIGH-LEVEL OBSERVATORY.

THE Assistant Government Geologist of Victoria, Mr. James Stirling, has just completed the erection of a high-level meteorological observatory at Mount St. Bernard, 5,000 ft. above sea-level. "This," writes the Melbourne *Age*, "is the highest altitude in Australia at which systematic weather observations have been taken. The instruments sent up by the Government Astronomer, Mr. Baracchi, have been placed in charge of Mr. Ellis, of the Hospice, who has been fully instructed in their use by Mr. Stirling. Thermometers, barometer, hygrometers, wind and rain gauges, and other instruments have been supplied. Mr. Stirling has also completed a series of observations on the deepest mines, as Lansell's 180, at Bendigo, over 2,000 ft. below sea-level. These observations on underground temperature, pressure of air, &c., will enable a comparison to be instituted with the recent researches of Professor Agassiz, in America, on the rate of increase of temperature with depth, and also be valuable for determining the best methods of ventilating mines at deep levels."—*Adelaide Advertiser.*